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**Title: POLYESTER COMPOSITION, METHOD OF PRODUCTION
AND USE FOR THE PRODUCTION OF HOLLOW ELEMENTS,
LIKE BOTTLES**

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PATENT APPLICATION

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60 References to other related national documents:

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54 Title of the Invention:

**POLYESTER COMPOSITION, METHOD OF PRODUCTION AND USE
FOR THE PRODUCTION OF HOLLOW ELEMENTS, LIKE BOTTLES**

57 Abstract The present invention relates to
compositions based on polyester that are particularly
suitable for the production of bottles.

More particularly, it relates to compositions
based on polyester that permit the production of bottles
with a low content of migrating products, like
acetaldehyde. The polyester-based compositions contain,
as principal component, a polyester or copolyester resin,
for example, polyethylene terephthalate, and, as an
additive to reduce acetaldehyde concentration, a β -
dicarbonyl compound, like stearylbenzoylmethane.

**POLYESTER COMPOSITION, METHOD OF PRODUCTION AND USE FOR THE
PRODUCTION OF HOLLOW ELEMENTS, LIKE BOTTLES**

The present invention relates to compositions based on polyester that are particularly suitable for the production of bottles.

It pertains, more particularly, to compositions based on polyester that permit the production of bottles with a low content of migrating products, like acetaldehyde.

Polyesters, and especially polyesters or copolyesters containing mostly polyethylene terephthalate units, are widely used for the production of different articles, like threads, filaments, molded articles. These polymers are also used to produce hollow elements, intended to contain different products, like food products. An important application is the production of bottles intended to contain foodstuffs, and especially mineral water.

These hollow elements or bottles are obtained as a result of the blow molding of an unfinished article, called a preform. The techniques for producing preforms and their blow molding, ordinarily called extrusion or injection blow molding techniques, are known and described in numerous documents.

In these technical fields, thermal degradation of the polyester, like polyethylene terephthalate, occurs when it is brought to temperatures higher than 250°C, and especially when it is in the molten state, for example, during the extrusion stage or mold injection stage, more particularly during the stage of molding of the preform. This thermal degradation, in particular, results in the formation of degradation byproducts, the most important of which is acetaldehyde. This acetaldehyde contained in the walls of the hollow elements migrates into the product contained in the hollow element or bottle, for example, into the water, in the case of a mineral water bottle.

Since a very low content of acetaldehyde alters the taste of foodstuffs, like beverages, for example mineral waters, it is necessary, during the production of polyester containers, either to reduce the amount of acetaldehyde contained in this polymer, and especially in the walls of the hollow elements, or to avoid migration of acetaldehyde into the products contained in said containers.

Numerous efforts have been made to reduce the acetaldehyde content in polyester before formation of the articles. Thus, the employed polyesters generally contain, before molding,

about 1 ppm of acetaldehyde. This low acetaldehyde content is obtained, in particular, in response to a polyester production process using a solid phase polycondensation stage that permits an increase in the viscosity index of the polyester at a temperature lower than 250°C. The rate of evaporation of acetaldehyde contained in the polyester is greater at this temperature than its rate of formation. Drying at temperatures below 200°C also permits a reduction in the acetaldehyde content without degradation of the polyester. Such processes are described, for example, in US Patents 4,263,425, 4,609,721.

Nevertheless, although the use of a polyester with low acetaldehyde content is necessary to produce bottles or hollow elements suitable for storage of foodstuffs, it is not sufficient. A non-negligible amount of acetaldehyde is formed during the molding stage, especially during injection molding or extrusion of polyester to form the article, as, for example, during the stage of producing the preform of a bottle. During this stage, the polyester is brought to a temperature greater than 270°C, close to 290°C, in order to be melted, and is fed under pressure into the molds or dies for extrusion, generally a screw extruder. Under these conditions, the polyester degrades and the rate of formation of acetaldehyde is conventionally greater than 4 ppm/min. Since this molding stage lasts about a minute, the final amount of acetaldehyde in the walls of the bottle is at least 60% accounted for by the acetaldehyde generated during this stage.

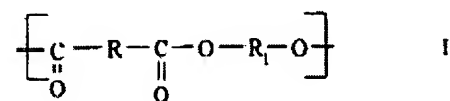
Major efforts have been made to propose more heat-stable polyesters, especially by means of selecting the catalytic system for the polycondensation. However, no significant results have been obtained.

Another solution was proposed to reduce the acetaldehyde content in the walls of the article or to reduce migration of acetaldehyde into the products contained in the container. This solution, described in US Patents 5,258,233 and 5,340,884, consists of adding 0.05 to 2 % by weight of a low molecular weight polyamide to the polyester. This addition has the effect of reducing the rate of acetaldehyde formation when the polyester is in the molten state (275-295°C). However, the addition of polyamide favors a degradation of the viscosity index of the polymer during the molding stage, which affects the mechanical properties of the finished article.

The purpose of the present invention therefore is to propose a new solution to reduce the acetaldehyde concentration in a polyester composition, and also limit the rate of migration of the acetaldehyde present in the polyester into the products contained in the containers obtained in response to molding of a polyester composition.

The expression "molding" is understood to mean any technique that consists of introducing a plastic composition into an enclosure in order to obtain an article of a desired shape, the shape being preserved by cooling of the material. The conventional molding techniques are injection molding, extrusion, pultrusion, injection or extrusion-blow molding.

For this purpose, the invention proposes a composition based on polyester, containing as the principal component a polyester or copolyester resin having recurring units of the general formula I

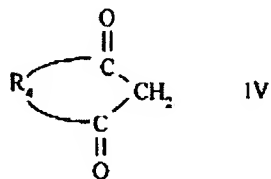
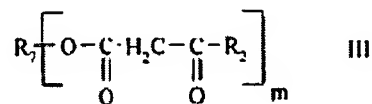
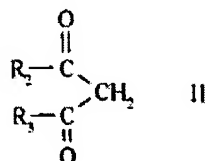


in which

R represents an aliphatic, aromatic, alkylaryl or arylalkyl hydrocarbon group,

R₁ represents an aliphatic, arylalkyl or cycloaliphatic hydrocarbon group.

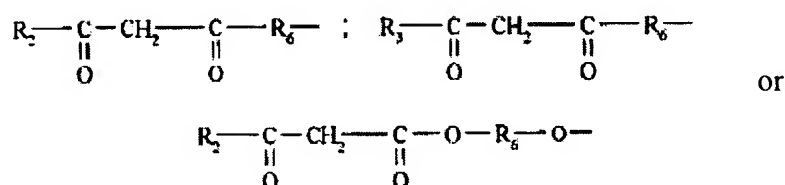
According to the invention, the composition also contains at least one β-dicarbonyl product, corresponding to one of the following general formulas II to IV:



in which :

R_2 , R_3 , which can be identical or different, represent:

- linear or branched alkyl, arylalkyl, aryl, alkylaryl radicals that can contain heteroatoms,
- a cycloaliphatic radical that can contain unsaturations,
- radicals of the formula $O-R_5$, in which R_5 represents an alkyl, arylalkyl or polyether radical
- a radical of the following formulas:



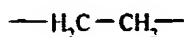
in which

- R_6 is an aliphatic or aromatic hydrocarbon radical
- R_4 is either a polyalkylene radical that can contain unsaturations or substituents, containing at least 2 alkylene radicals, or a radical of the formula $-\text{O}-R_8-\text{O}-$, in which R_8 is an aliphatic radical,
- R_7 is an alkyl or arylalkyl radical,
- m is a whole number from 1 through 6

As polyesters suitable for the invention, one can mention those containing at least 90 mol% recurring units of formula I, in which R represents the radical:



and R_1 the radical:



However, the invention also applies to polyesters containing recurring units of formula I, in which R represents the naphthenylidene radical, or copolyesters based on either polyethylene terephthalate or polyethylene naphthalenate.

Advantageously, the preferred polyesters of the invention are polyethylene terephthalate and copolyesters containing mostly polyethylene terephthalate units, and, as a comonomer, a crystallization inhibitor, as described in Patent EP 41 035.

Thus, as comonomers, carboxylic diacids, like isophthalic acid, orthophthalic acid, naphthalenic diacids, aliphatic or cycloaliphatic carboxylic acids can be mentioned.

The copolyester can also be obtained as a result of replacing part of the ethylene glycol with other diols, like cycloaliphatic or aliphatic diols. As examples, the following can be mentioned: diethylene glycol; triethylene glycol; 1,4-cyclohexanedimethanol; 1,3-propanediol; 1,4-butanediol; 1,5-pentanediol; 1,6-hexanediol; 3-methyl-2,4-pentanediol; 2-methyl-1,4-pentanediol; 2,2,4-trimethyl-1,3-pentanediol; 2-ethyl-1,3-hexanediol; 2,2-diethyl-1,3-propanediol; 1,3-hexanediol; 1,4-dihydroxyethoxybenzene; 2,2-bis(4-hydroxycyclohexyl)propane; 2,4-dihydroxy-1,1,3,3-tetramethylcyclobutane; 2,2-bis(3-hydroxyethoxyphenyl)propane and 2,2-bis(4-hydroxypropoxyphenyl)propane.

The polyesters of the invention are produced according to the conventional methods of polycondensation, like the polycondensation process employing diacids and diols as monomers with a direct esterification stage, or from esters of diacids and diols with a transesterification stage. Generally, the polyesters, used in the form of granules, are subjected to a post-polycondensation stage in the solid phase or to drying at a temperature below 220°C in order to obtain, on the one hand, polyester resins with an increased degree of polymerization, and, on the other hand, a low concentration of acetaldehyde in the granules. These postcondensation stages in the solid phase or drying are often conducted in a weakly oxidizing or non-oxidizing atmosphere to limit degradation of the polymer.

Generally, the polyester used in the molding processes has a viscosity index between 0.8 and 1.2 dL/g, measured according to standard ISO 1628 (viscosity index determined on a 0.5 % by weight solution of polymer in a solvent consisting of 50 % by weight of phenol and 50% of 1,2-dichlorobenzene).

Generally, the polyester resins are in the form of granules with a length of about 1 to 5 mm and a thickness between 1 and 3 mm, and a width between 2 and 4 mm.

According to the desired application, they can contain additives that are added to the polymerization, like titanium oxide, used as a matting agent, optical brighteners, dyes or pigments, stabilizers of different types.

Examples of β -dicarbonyl compounds suitable for the invention that can be mentioned are: heptane-2,4-dione; decane-2,4-dione; 2-methyl-2-decene-6,8-dione; 2-methyl-2-nonene-6,8-dione; stearoylacetone; 1-stearoyl-2-octanone; ethyl-7,9-dioxodecanoate; benzoylacetone; 1-benzoyl-2-octanone; 1,4-diphenyl-1,3-butanedione; stearoylacetophenone; palmitoylacetophenone; 1-benzoyl-4-methyl-2-pentanone; benzoyloctacosanoylmethane; 1,4-bis(2,4-dioxobutyl)benzene; paramethoxybenzoylstearylmethane; acetoacetyl-3-cyclohexene; dibenzoylmethane; bis(paramethoxybenzoyl)methane; diacetylacetoheptane; 1,4-bis(acetoacetyl)butane; 1,10-bis(acetoacetyl)octane; 1,10-bis(acetoacetyl)decane; 1,10-diphenyldecane-1,3,8,10-tetraone; 1,13-diphenyltridecane-1,3,11,13-tetraone; 1,14-diphenyltetradecane-1,3,12,14-tetraone; 1,16-diphenylhexadecane-1,3,14,16-tetraone; benzoyloctanoylmethane; benzoyliso-octanoylmethane; butyl malonate; pentyl malonate; hexyl malonate; cetyl malonate; stearyl malonate; cyclohexyl malonate; cyclohexenyl malonate; malonic polyesters obtained as a result of the reaction of a diol, like ethylene glycol, 1,4-butanediol, cyclohexanedimethanol or 1,6-hexanediol with malonic acid; acetoacetates and benzoylacetates of monohydric alcohols containing 4 to 22 carbon atoms, like hexanol, decanol, cetanol or stearyl alcohol; acetoacetates or benzoylacetates of diols with polyols, like acetoacetates of ethylene glycol, glycerol, 1,4-butanediol, trimethylolpropane, pentaerythritol, sorbitol, tris(hydroxyethyl) isocyanurate; 1,3-cyclohexanedione; 5,5-dimethyl-1,3-cyclohexanedione; cyclic malonates, like 2,2-dimethyl-1,3-dioxane-4,6-[dione] [*"dione" omitted in original, inferred from context – Translator*].

According to one characteristic of the invention, the β -dicarbonyl compound is present in the polyester before molding in a weight concentration between 0.01% and 5 % by weight, in reference to the weight of the polyester, preferably between 0.05% and 1%.

After molding of the polyester composition according to the invention, for example, the production of a preform of a bottle, the β -carbonyl compound is present in the walls of the preform in free form or in chemically combined form with the products present in the polyester,

like acetaldehyde. The same is true in the walls of the bottle obtained by means of blow molding of the preform.

Naturally, the polyester composition of the invention can contain other additives ordinarily added, like agents to assist in molding, heat or light stabilizers, dyes, pigments, optical brighteners or similar substances, antioxidants, UV absorbents, nucleation agents, reinforcement fillers or agents to improve properties of the polyester, or similar substances. These additives are present in the conventional and usual concentrations.

The invention also relates to a process for the production of a polyester composition according to the invention.

This process consists of mixing the β -dicarbonyl compound with the polyester. Advantageously, the β -dicarbonyl compound is added to the polyester having the desired degree of polymerization and a low residual acetaldehyde content.

Thus, the β -dicarbonyl compound is preferably added to a polyester subjected either to postcondensation in the solid phase or drying. This addition is also accomplished on a polyester in the form of solid granules or in a polyester in the molten state.

The β -dicarbonyl compound is added to the polyester either in the form of a solid or liquid, depending on the state of said compound and its addition temperature.

However, in a preferred embodiment of the invention, the β -dicarbonyl compound is added in the form of a concentrated composition, also called masterbatch. Such a composition is obtained by means of mixing said β -dicarbonyl compound into a polymer material at a weight concentration greater than 5% relative to the concentrated composition.

The polymer matrix can advantageously be a polyester, identical or not, to that of the composition being molded.

Other polymer matrices can be used, if compatible with the polyester of the final composition being molded, like polycarbonate resins.

Use of a concentrated composition facilitates the addition of the β -dicarbonyl compound and its dispersion in the polyester.

In addition, this concentrated composition can also be obtained in the form of granules that permit the addition of the β -dicarbonyl compound to the polyester as a result of the mixing of the granules of the concentrated composition and the granules of the polyester before melting,

in order to be fed to the molding processes. This addition process permits a more homogeneous mixture to be obtained.

Moreover, the concentrated composition can also contain other additives that must be added to the polyester, like those described previously.

The invention also relates to such a concentrated composition, containing from 30 to 95 % by weight of polymer material and at least 5 % by weight of β -dicarbonyl compound, preferably 5 to 30% of this compound relative to the concentrated composition.

Finally, the invention relates to the use of a polyester composition according to the invention for the production of particles, like hollow elements, and more advantageously bottles. These bottles, which have a low acetaldehyde content and a low rate of migration of acetaldehyde, are particularly suitable for the storage of foodstuffs, like carbonated or noncarbonated beverages, and especially mineral waters or natural waters.

Other purposes, advantages and details of the invention will be more apparent with reference to the examples, provided solely as an illustration without limiting characteristics.

Experiments to add a β -dicarbonyl compound to a polyethylene terephthalate were carried out according to the operating method described below.

The residual acetaldehyde content was measured in the rods or granules obtained in response to the extrusion of this mixture. The rates of formation of acetaldehyde were measured on the same products at a temperature of 280°C.

The residual acetaldehyde content was measured with the help of gas chromatography (GC) according to the "headspace" method, i.e., desorption of acetaldehyde contained in the ground polyester and determined with the help of GC of the aldehyde in the gas phase. Grinding of the polyester granules was carried out in liquid nitrogen in a cryogenic grinder with the commercial name SPEX 6700. This grinding is accomplished as a result of a first grinding period lasting 2 minutes at a slow speed of the grinder, and then a second period of 5 minutes at a high speed of the grinder. The obtained powder has a particle size less than 500 μm .

The gas phase sample is taken according to the "headspace" method, used with the PERKIN ELMER HS 40 apparatus. The weighed amount of sample is 250 g, the temperature 145°C and the time 1.5 hours.

Chromatographic analysis is carried out with the help of a VARIAN 3500 apparatus and a CHROMPACK Poraplot Q column. The carrier gas is nitrogen and the column temperature varies from 60°C to 230°C with a rate of temperature increase of 10°C/min. The detector is of the FID type.

Calibration of the apparatus was carried out with a solution of acetaldehyde in dimethylacetamide.

The rate of acetaldehyde formation was measured according to the following method: 2 g of polyester is ground with the cryogenic grinder just described and according to the same protocol.

A sample of 100 mg of obtained powder is taken and introduced to a tube sealed with a teflon capsule.

Two needles are introduced into the Teflon capsule, the end of one being located 1 cm from the bottom of the tube that of the other needle being located 1 cm from the end of the tube.

The tube is purged with extra-pure nitrogen at a flow rate of 30 mL/min for 30 minutes, the tube being kept at 120°C. This purging eliminates the residual acetaldehyde.

After cooling, the tube is immersed in a metal bath at 280°C for 10 minutes to about 5 seconds [sic]¹, then cooled in silicone oil for 2 minutes.

The formed acetaldehyde is determined according to the method described above for the determination of the residual acetaldehyde.

The polyesters are also characterized by means of a colorimetric analysis in order to determine the components L*, a*, b* according to the CIE LAB method.

The viscosity index was determined with the help of the standard ISO 1628 method, and the crystal opacity after molding is observed according to the variable thickness injection method described in European Patent No. 41035.

These experiments were performed by means of the addition of a β -carbonyl compound, marketed by RHONE-POULENC under the trade name RHODIASTAB 50[®] (this compound is

¹ **Translator's Note:** the French source document reads exactly as the translations states, i.e. "...immersed in a metal bath at 280°C for 10 minutes to about 5 seconds...." In this instance, we can't even guess as to what the authors may have intended to express here, except that they perhaps meant to say "...for 10 minutes to a precision of about 5 seconds..." which could be more simply stated as "...for 10 min \pm 5 secs."

essentially a stearylbenzoylmethane), to polyester granules. This polyester is a polyethylene terephthalate, obtained as a result of the reaction and polycondensation of ethylene glycol with a mixture of terephthalic acid/isophthalic acid. The isophthalic acid represents 2.4 mol% of the terephthalic acid/isophthalic acid mixture. This polyester is marketed by TERGAL FIBRES under the commercial name T 74 T 00 F4.

The mixture is melted in a single screw extruder at 285°C, then extruded in the form of a rod, which is cut into granules 3 mm long, 1.66 mm thick and about 2.7 mm wide.

A control production test of the polyester granules without the addition of the β -carbonyl compound is carried out under the same conditions.

The results from the characterization of the obtained polyester are summarized in the following Table 1.

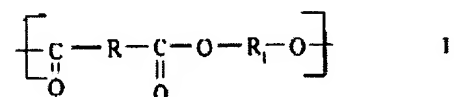
Table 1

Characteristics		Control	Example 1	Example 2
β -carbonyl compound % by weight		-	Rhodiastab 50 [®] 0.10%	Rhodiastab 50 [®] 0.50%
Extrusion conditions	Rotational speed (rpm)	60	60	60
	Dwell time (s)	100	50	50
Viscosity index (mL/g)		68.3	69.9	69.0
Coloration	L*	71.5	72.1	71.6
	a*	-0.7	-0.3	-0.1
	b*	4.4	3.9	6.2
Residual acetaldehyde content		19 ppm	14 ppm	13 ppm
Rate of acetaldehyde formation (ppm/min)		5.3	4.0	3.7

In addition, experiments relating to the injection of specimens with variable thickness according to the process described in European Patent 41035 demonstrate that the incorporation of the β -dicarbonyl compound has no adverse effect on the crystallization and haze of the specimen.

CLAIMS

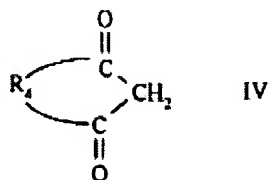
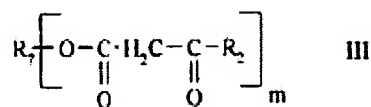
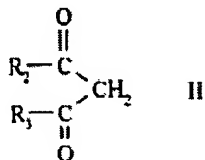
1 – A composition based on polyester, containing, as the principal component, a polyester or copolyester resin, containing recurrent units of the following general formula I:



in which

R represents an aliphatic, aromatic, alkylaryl or arylalkyl hydrocarbon group; the groups R can be different.

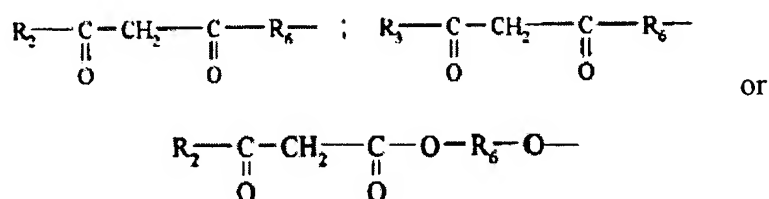
R₁ represents a hydrocarbon or arylalkyl group and can be different, characterized by the fact that it contains at least one β-dicarbonyl compound, corresponding to one of the following general formulas II to IV:



in which :

R₂, R₃, which can be identical or different, represent:

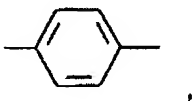
- linear or branched alkyl, arylalkyl, aryl, alkylaryl radicals that can contain heteroatoms,
- a cycloaliphatic radical that can contain unsaturations,
- radicals of the formula O-R₅, in which R₅ represents an alkyl, arylalkyl or polyether radical
- a radical of the following formulas:



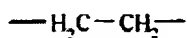
in which

- R₆ is an aliphatic or aromatic hydrocarbon radical
- R₄ is either a polyalkylene radical that can contain unsaturations or substituents, containing at least 2 alkylene radicals, or a radical of the formula -O-R₈-O-, in which R₈ is an aliphatic radical,
- R₇ is an alkyl or arylalkyl radical,
- m is a whole number from 1 through 6

2 – The composition according to Claim 1, characterized by the fact that, in at least 90% of the recurring units of general formula I of the polyester, radical R is:



and radical R₁ is:



3 – The composition according to Claim 2, characterized by the fact that the polyester contains recurring units of general formula I, derived from comonomers, chosen from the following group: isophthalic acid, orthophthalic acid, naphthalenic diacids, aliphatic or cycloaliphatic carboxylic acids, diethylene glycol; triethylene glycol; 1,4-cyclohexanedimethanol; 1,3-propanediol; 1,4-butanediol; 1,5-pentanediol; 1,6-hexanediol; 3-methyl-2,4-pentanediol; 2-methyl-1,4-pentanediol; 2,2,4-trimethyl-1,3-pentanediol; 2-ethyl-1,3-hexanediol; 2,2-diethyl-1,3-propanediol; 1,3-hexanediol; 1,4-dihydroxyethoxybenzene; 2,2-bis(4-hydroxycyclohexyl)propane; 2,4-dihydroxy-1,1,3,3-tetramethylcyclobutane; 2,2-bis(3-hydroxyethoxyphenyl)propane and 2,2-bis(4-hydroxypropoxyphenyl)propane.

4 – The composition according to one of the preceding claims, characterized by the fact that the β -dicarbonyl compound is present in the polyester composition in a weight concentration between 0.01 % by weight and 5 % by weight of the polyester resin.

5 – The composition according to Claim 4, characterized by the fact that the β -dicarbonyl compound is present in the polyester composition in a weight concentration between 0.05 % by weight and 1 % by weight of the polyester resin.

6 – The composition according to one of the Claims 1 to 5, characterized by the fact that the β -dicarbonyl compound is chosen from the group comprising: heptane-2,4-dione; decane-2,4-dione; 2-methyl-2-decene-6,8-dione; 2-methyl-2-nonene-6,8-dione; stearoylacetone; 1-stearoyl-2-octanone; ethyl-7,9-dioxodecanoate; benzoylacetone; 1-benzoyl-2-octanone; 1,4-diphenyl-1,3-butanedione; stearoylacetophenone; palmitoylacetophenone; 1-benzoyl-4-methyl-2-pentanone; benzoyloctacosanoylmethane; 1,4-bis(2,4-dioxobutyl)benzene; paramethoxybenzoylstearyl-methane; acetoacetyl-3-cyclohexene; dibenzoylmethane; bis(para-methoxybenzoyl)methane; diacetylaceto-hexane; 1,4-bis(acetoacetyl)butane; 1,10-bis(acetoacetyl)octane; 1,10-bis(acetoacetyl)decane; 1,10-diphenyldecane-1,3,8,10-tetraone; 1,13-diphenyltridecane-1,3,11,13-tetraone; 1,14-diphenyltetradecane-1,3,12,14-tetraone; 1,16-diphenylhexadecane-1,3,14,16-tetraone; benzoyloctanoylmethane; benzoylisooctanoylmethane; butyl malonate; pentyl malonate; hexyl malonate; cetyl malonate; stearyl malonate; cyclohexyl malonate; cyclohexenyl malonate; malonic polyesters obtained as a result of the

reaction of a diol, like ethylene glycol, 1,4-butanediol, cyclohexanedimethanol or 1,6-hexanediol with malonic acid; acetoacetates and benzoyl acetates of monohydric alcohols containing 4 to 22 carbon atoms, like hexanol, decanol, cetanol or stearyl alcohol; acetoacetates or benzoylacetates of diols with polyols, like acetoacetates of ethylene glycol, glycerol, 1,4-butanediol, trimethylolpropane, pentaerythritol, sorbitol, tris(hydroxyethyl) isocyanurate; 1,3-cyclohexanedione; 5,5-dimethyl-1,3-cyclohexanedione; cyclic malonates, like 2,2-dimethyl-1,3-dioxane-4,6-[dione].

7 – The composition according to one of the preceding claims, characterized by the fact that it contains additives chosen from the group comprising lubricating agents, stabilizers, antioxidants, UV absorbents, dyes, optical brighteners, nucleation agents, additives to assist molding, and fillers.

8 – The process for the production of a composition according to one of the Claims 1 to 7, characterized by the fact that it consists of mixing the polyester resin with the β -dicarbonyl compound of formulas II, III or IV as a result of the addition of said β -dicarbonyl compound to the polyester before or during the polyester melting stage, before being fed to the molding processes.

9 – The process according to Claim 8, characterized by the fact that the β -dicarbonyl compound is added to the polyester in the form of a solid or liquid, before the melting and molding stage of said polyester.

10 – The process according to one of the Claims 8 or 9, characterized by the fact that the β -dicarbonyl compound is added to a polyester subjected to a postcondensation in the solid phase or drying in order to reduce the residual acetaldehyde content.

11 – The process according to one of the Claims 8 or 10, characterized by the fact that the β -dicarbonyl compound is added to the polyester in the form of a concentrated composition, containing a polymer matrix and at least the β -dicarbonyl compound in a weight concentration greater than 5%, preferably 5 to 30 % by weight, relative to the concentrate composition.

12 – The process according to Claim 11, characterized by the fact that the polymer matrix of the concentrated composition is a polyester.

13 – The process according to Claim 11 or 12, characterized by the fact that the concentrated composition contains other additives, chosen from the group comprising lubricating agents, stabilizers, antioxidants, UV absorbents, dyes, optical brighteners, nucleation agents, additives to assist molding, and fillers.

14 – The process according to one of the Claims 11 to 13, characterized by the fact that the addition of the β -dicarbonyl compound to the polyester composition is accomplished as a result of mixing granules of the concentrated composition with granules of the polyester.

15 – Concentrated composition, useful for reducing acetaldehyde content of polyesters, characterized by the fact that it contains 5 to 95 % by weight in the polymer matrix and at least 5 % by weight of a β -dicarbonyl compound, defined in the preceding claims.

16 – The concentrate composition according to Claim 15, characterized by the fact that the polymer matrix is a polyester resin.

17 – The concentrate composition according to one of the Claims 15 or 16, characterized by the fact that it contains additives, chosen from the group comprising lubricants, stabilizers, antioxidants, UV absorbents, dyes, optical brighteners, nucleation agents, additives to assist molding, and fillers.

18 – Use of a composition according to one of the Claims 1 to 7 for the production of molded articles.

19 – Use of a composition according to one of the Claims 1 to 7 for the production of hollow elements.

20 – Use according to Claim 19, characterized by the fact that the hollow element is a bottle intended for the storage of foodstuffs.